

AMENDMENTS

Please amend the claims as follows:

1. (currently amended) Functionalized zirconium oxide particles comprising:
~~a surface~~ surfaces comprising a total quantity of hydroxyl groups comprising a
complexed fraction of hydroxyl groups comprising a reactive portion of
hydroxyl groups and a less reactive portion of hydroxyl groups;
said reactive portion of hydroxyl groups being complexed with functionalities
selected from the group consisting of functionalities with high steric
hindrance, functionalities with low steric hindrance, and a combination
thereof;
said less reactive portion of hydroxyl groups being complexed with said groups
having a low steric hindrance.

2. (previously amended) The functionalized zirconium oxide particles of claim 1
wherein said functionalities having a low steric hindrance comprise mobile adhesion
promoters and said functionalities having a high steric hindrance comprise organofunctional
coupling agents.

3. (currently amended) The functionalized zirconium oxide particles of claim 1
wherein said complexed fraction of hydroxyl groups is effective to produce a coagulation
point of about 1 minute or more.

4. (currently amended) The functionalized zirconium oxide particles of claim 1
wherein said complexed fraction of hydroxyl groups is effective to produce a coagulation
point of about 1 hour or more.

1 5. (currently amended) The functionalized zirconium oxide particles of claim 2
2 wherein said complexed fraction of hydroxyl groups is effective to produce a coagulation
3 point of about 1 minute or more.

1 6. (currently amended) The functionalized zirconium oxide particles of claim 2
2 wherein said complexed fraction of hydroxyl groups is effective to produce a coagulation
3 point of about 1 hour or more.

1 7. (currently amended) The functionalized zirconium oxide particles of claim 1
2 wherein said complexed fraction of hydroxyl groups is about 50% or more of said total
3 quantity of hydroxyl groups.

1 8. (currently amended) The functionalized zirconium oxide particles of claim 2
2 wherein said organofunctional coupling agents are irreversibly complexed with said reactive
3 portion of hydroxyl groups.

1 9. (currently amended) The functionalized zirconium oxide particles of claim 1
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 10. (currently amended) The functionalized zirconium oxide particles of claim 2
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 11. (currently amended) The functionalized zirconium oxide particles of claim 3
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 12. (currently amended) The functionalized zirconium oxide particles of claim 4
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 13. (currently amended) The functionalized zirconium oxide particles of claim 5
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 14. (currently amended) The functionalized zirconium oxide particles of claim 6
2 wherein said complexed fraction of hydroxyl groups comprises substantially all of said total
3 quantity of hydroxyl groups.

1 15. (currently amended) Functionalized zirconium oxide particles comprising a
2 surface comprising a total quantity of hydroxyl groups comprising a complexed fraction of
3 hydroxyl groups and an uncomplexed fraction of hydroxyl groups, said complexed fraction
4 of hydroxyl groups being effective to produce a coagulation point of about one minute or
5 more after removal of a solvent from a mixture of said ~~metal~~-zirconium oxide particles and a
6 matrix resin.

1 16. (currently amended) The functionalized zirconium oxide particles of claim 15
2 wherein said complexed fraction of hydroxyl groups is effective to produce a coagulation
3 point of about one hour or more after removal of a solvent.

1 17. (currently amended) The functionalized zirconium oxide particles of claim 15
2 wherein said complexed portion of hydroxyl groups comprises a less reactive portion of
3 hydroxyl groups complexed with a mobile adhesion promoter and a more reactive portion of
4 hydroxyl groups complexed with an organofunctional coupling agent.

1 18. (currently amended) The functionalized zirconium oxide particles of claim 16
2 wherein said complexed portion of hydroxyl groups comprises a less reactive portion of
3 hydroxyl groups complexed with a mobile adhesion promoter and a more reactive portion of
4 hydroxyl groups complexed with an organofunctional coupling agent.

1 19. (previously amended) The functionalized zirconium oxide particles of claim
2 17 wherein the organofunctional coupling agent also comprises an adhesion promoter.

1 20. (previously amended) The functionalized zirconium oxide particles of claim
2 18 wherein the organofunctional coupling agent also comprises an adhesion promoter.

1 21. (previously canceled) The functionalized metal oxide particles of claim 1
2 wherein the metal oxide comprises a metal selected from the group consisting of niobium,
3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, silicon
4 and combinations thereof.

1 22. (previously canceled) The functionalized metal oxide particles of claim 2
2 wherein said metal oxide comprises a metal selected from the group consisting of niobium,
3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, and
4 combinations thereof.

1 23. (previously canceled) The functionalized metal oxide particles of claim 3
2 wherein the metal oxide comprises a metal selected from the group consisting of niobium,
3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, silicon
4 and combinations thereof.

1 24. (previously canceled) The functionalized metal oxide particles of claim 4
2 wherein said metal oxide comprises a metal selected from the group consisting of niobium,

3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, and
4 combinations thereof.

1 25. (previously canceled) The functionalized metal oxide particles of claim 21
2 wherein said metal oxide comprises a metal selected from the group consisting of niobium,
3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, and
4 combinations thereof.

1 26. (previously canceled) The functionalized metal oxide particles of claim 22
2 wherein said metal oxide comprises a metal selected from the group consisting of niobium,
3 indium, titanium, zinc, zirconium, tin, cerium, hafnium, tantalum, tungsten, bismuth, and
4 combinations thereof.

1 27. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~23~~3 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 28. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~24~~4 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 29. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~25~~1 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 30. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~26~~22 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 31. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~27~~17 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 32. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim ~~28~~18 further comprising an alloying element selected from the group
3 consisting of aluminum, phosphorus, gallium, germanium, barium, strontium, yttrium,
4 niobium, antimony, cesium, and combinations thereof.

1 33. (previously canceled) The functionalized metal oxide particles of claim 1
2 wherein said metal comprises zirconium.

1 34. (previously canceled) The functionalized metal oxide particles of claim 2
2 wherein said metal comprises zirconium.

1 35. (previously canceled) The functionalized metal oxide particles of claim 3
2 wherein said metal comprises zirconium.

1 36. (previously canceled) The functionalized metal oxide particles of claim 4
2 wherein said metal comprises zirconium.

1 37. (previously canceled) The functionalized metal oxide particles of claim 17
2 wherein said metal comprises zirconium.

1 38. (previously canceled) The functionalized metal oxide particles of claim 18
2 wherein said metal comprises zirconium.

1 39. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 1 further comprising a mixture comprising a matrix resin comprising
3 monomers comprising functional groups polymerizable with said organofunctional coupling
4 agents.

1 40. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 2 further comprising a mixture comprising a matrix resin comprising
3 monomers comprising functional groups polymerizable with said organofunctional coupling
4 agents.

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1 41. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 5 further comprising a mixture comprising a matrix resin comprising
3 monomers comprising functional groups polymerizable with said organofunctional coupling
4 agents.

1 42. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 6 further comprising a mixture comprising a matrix resin comprising
3 monomers comprising functional groups polymerizable with said organofunctional coupling
4 agents.

1 43. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 17 further comprising a mixture comprising a matrix resin
3 comprising monomers comprising functional groups polymerizable with said
4 organofunctional coupling agents.

1 44. (previously amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 18 further comprising a mixture comprising a matrix resin
3 comprising monomers comprising functional groups polymerizable with said
4 organofunctional coupling agents.

1 45. (currently amended) The functionalized zirconium oxide particles of claim 4
2 39 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 46. (currently amended) The functionalized zirconium oxide particles of claim 2
2 40 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 47. (currently amended) The functionalized zirconium oxide particles of claim 5
2 41 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 48. (currently amended) The functionalized zirconium oxide particles of claim 6
2 42 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 49. (currently amended) The functionalized zirconium oxide particles of claim 17
2 43 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 50. (currently amended) The functionalized zirconium oxide particles of claim 18
2 44 comprising an average diameter effective to permit curing of said mixture by
3 photopolymerization.

1 51. (currently amended) The functionalized zirconium oxide particles of claim 2
2 wherein a sufficient quantity of said reactive portion of hydroxyl groups is complexed with
3 an organofunctional coupling agent to provide fracture toughness of a cured composite
4 comprising said functionalized ~~metal~~ zirconium oxide particles.

1 52. (currently amended) The functionalized zirconium oxide particles of claim 5
2 wherein a sufficient quantity of said reactive portion of hydroxyl groups is complexed with
3 said organofunctional coupling agent to provide fracture toughness of a cured composite
4 comprising said functionalized ~~metal~~ zirconium oxide particles.

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1 53. (currently amended) The functionalized zirconium oxide particles of claim 6
2 wherein -a sufficient quantity of said reactive portion of hydroxyl groups is complexed with
3 said organofunctional coupling agent to provide fracture toughness of a cured composite
4 comprising said functionalized ~~metal~~ zirconium oxide particles.

1 54. (currently amended) The functionalized zirconium oxide particles of claim 17
2 wherein a sufficient quantity of said reactive portion of hydroxyl groups is complexed with
3 said organofunctional coupling agent to provide fracture toughness of a cured composite
4 comprising said functionalized ~~metal~~ zirconium oxide particles.

1 55. (currently amended) The functionalized zirconium oxide particles of claim 18
2 wherein a sufficient quantity of said reactive portion of hydroxyl groups is complexed with
3 said organofunctional coupling agent to provide fracture toughness of a cured composite
4 comprising said functionalized ~~metal~~ zirconium oxide particles.

1 56. (previously amended) The functionalized zirconium oxide particles of claim 2
2 wherein the organofunctional coupling agent comprises a polymerizable group selected from

3 the group consisting of one or more vinyl groups, acryl groups, epoxy groups, and methacryl
4 groups.

1 57. (previously amended) The functionalized zirconium oxide particles of claim 5
2 wherein the organofunctional coupling agent comprises a polymerizable group selected from
3 the group consisting of one or more vinyl groups, acryl groups, epoxy groups, and methacryl
4 groups.

1 58. (previously amended) The functionalized zirconium oxide particles of claim 6
2 wherein the organofunctional coupling agent comprises a polymerizable group selected from
3 the group consisting of one or more vinyl groups, acryl groups, epoxy groups, and methacryl
4 groups.

1 59. (previously amended) The functionalized zirconium oxide particles of claim
2 17 wherein the organofunctional coupling agent comprises a polymerizable group selected
3 from the group consisting of one or more vinyl groups, acryl groups, epoxy groups, and
4 methacryl groups.

1 60. (previously amended) The functionalized zirconium oxide particles of claim
2 18 wherein the organofunctional coupling agent comprises a polymerizable group selected
3 from the group consisting of one or more vinyl groups, acryl groups, epoxy groups, and
4 methacryl groups.

1 61. (previously amended) The functionalized zirconium oxide particles of claim
2 56 wherein the organofunctional coupling agent comprises a functionality selected from the
3 group consisting of mono-, di-, and tri-functional silanes, isocyanates, zirconates,
4 aluminozirconates, zirconyl methacrylate, titanates, and phosphonates.

1 63. (previously amended) The functionalized zirconium oxide particles of claim
2 58 wherein the organofunctional coupling agent comprises a functionality selected from the
3 group consisting of mono-, di-, and tri-functional silanes, isocyanates, zirconates,
4 aluminozirconates, zirconyl methacrylate, titanates, and phosphonates.

64. (previously amended) The functionalized zirconium oxide particles of claim 59 wherein the organofunctional coupling agent comprises a functionality selected from the group consisting of mono-, di-, and tri-functional silanes, isocyanates, zirconates, aluminozirconates, zirconyl methacrylate, titanates, and phosphonates.

65. (previously amended) The functionalized zirconium oxide particles of claim 60 wherein the organofunctional coupling agent comprises a functionality selected from the group consisting of mono-, di-, and tri-functional silanes, isocyanates, zirconates, aluminozirconates, zirconyl methacrylate, titanates, and phosphonates.

1 66. (previously amended) The functionalized zirconium oxide particles of claim 2
2 wherein the organofunctional groups are hydrolyzable zirconates having the following
3 general structure:



5 wherein

6 R^1 is selected from the group consisting of hydrolyzable alkyl groups and
 7 hydrolyzable alkenyl groups having 1 or more carbon atoms; and
 8 R^2 is selected from the group consisting of copolymerizable alkenyl substituents
 9 containing 2 or more carbon atoms.

1 67. (previously amended) The functionalized zirconium oxide particles of claim 5
 2 wherein the organofunctional groups are hydrolyzable zirconates having the following
 3 general structure:



5 wherein

6 R^1 is selected from the group consisting of hydrolyzable alkyl groups and
 7 hydrolyzable alkenyl groups having 1 or more carbon atoms; and
 8 R^2 is selected from the group consisting of copolymerizable alkenyl substituents
 9 containing 2 or more carbon atoms.

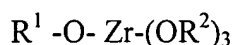
1 68. (previously amended) The functionalized zirconium oxide particles of claim 6
 2 wherein the organofunctional groups are hydrolyzable zirconates having the following
 3 general structure:



5 wherein

6 R^1 is selected from the group consisting of hydrolyzable alkyl groups and
 7 hydrolyzable alkenyl groups having 1 or more carbon atoms; and
 8 R^2 is selected from the group consisting of copolymerizable alkenyl substituents
 9 containing 2 or more carbon atoms.

69. (previously amended) The functionalized zirconium oxide particles of claim 17 wherein the organofunctional groups are hydrolyzable zirconates having the following general structure:

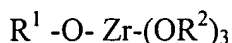


wherein

R^1 is selected from the group consisting of hydrolyzable alkyl groups and hydrolyzable alkenyl groups having 1 or more carbon atoms; and

R^2 is selected from the group consisting of copolymerizable alkenyl substituents containing 2 or more carbon atoms.

70. (previously amended) The functionalized zirconium oxide particles of claim 18 wherein the organofunctional groups are hydrolyzable zirconates having the following general structure:



wherein

R^1 is selected from the group consisting of hydrolyzable alkyl groups and hydrolyzable alkenyl groups having 1 or more carbon atoms; and

R^2 is selected from the group consisting of copolymerizable alkenyl substituents containing 2 or more carbon atoms.

71. (previously amended) The functionalized zirconium oxide particles of claim 66 wherein R^1 is selected from the group consisting of alkyl groups having from about 1 to about 9 carbon atoms.

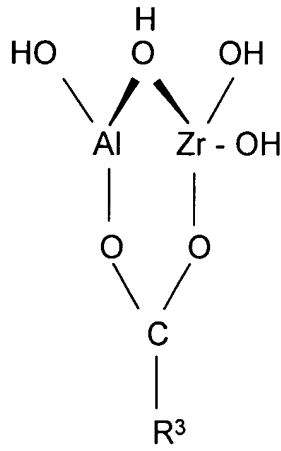
1 72. (previously amended) The functionalized zirconium oxide particles of claim
2 67 wherein R¹ is selected from the group consisting of alkyl groups having from about 1 to
3 about 9 carbon atoms.

1 73. (previously amended) The functionalized zirconium oxide particles of claim
2 68 wherein R¹ is selected from the group consisting of alkyl groups having from about 1 to
3 about 9 carbon atoms.

1 74. (previously amended) The functionalized zirconium oxide particles of claim
2 69 wherein R¹ is selected from the group consisting of alkyl groups having from about 1 to
3 about 9 carbon atoms.

1 75. (previously amended) The functionalized zirconium oxide particles of claim
2 70 wherein R¹ is selected from the group consisting of alkyl groups having from about 1 to
3 about 9 carbon atoms.

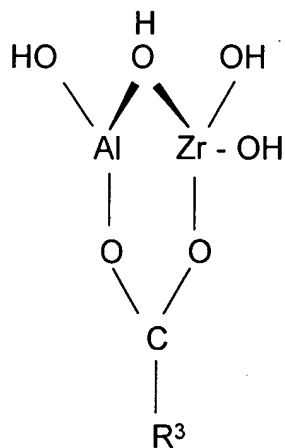
1 76. (currently amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 2 wherein the organofunctional ~~groups~~ coupling agents comprise
3 ~~moeities~~ moieties selected from the group consisting of neopentyl (diallyl) oxy trimethacryl
4 zirconates, neopentyl (diallyl) oxy triacryl zirconates, and aluminozirconates having the
5 following general structure:
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8 wherein R^3 is selected from the group consisting of copolymerizable alkenyl groups and
 9 carboxyfunctional substituents containing 1 or more carbon atoms.

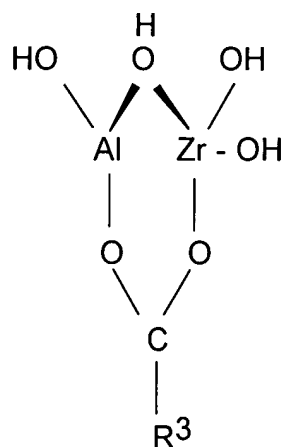
1 77. (currently amended, withdrawal contested) The functionalized metal oxide
 2 particles of claim 5 wherein the organofunctional ~~groups~~ coupling agents comprise ~~moeities~~
 3 moieties selected from the group consisting of neopentyl (diallyl) oxy trimethacryl
 4 zirconates, neopentyl (diallyl) oxy triacryl zirconates, and aluminozirconates having the
 5 following general structure: wherein R^3 is selected from the group consisting of
 6 copolymerizable alkenyl groups and carboxyfunctional substituents containing 1 or more
 7 carbon atoms.

1 78. (currently amended, withdrawal contested) The functionalized zirconium
 2 oxide particles of claims 6 wherein the organofunctional ~~groups~~ coupling agents comprise
 3 ~~moeities~~ moieties selected from the group consisting of neopentyl (diallyl) oxy trimethacryl
 4 zirconates, neopentyl (diallyl) oxy triacryl zirconates, and aluminozirconates having the
 5 following general structure:



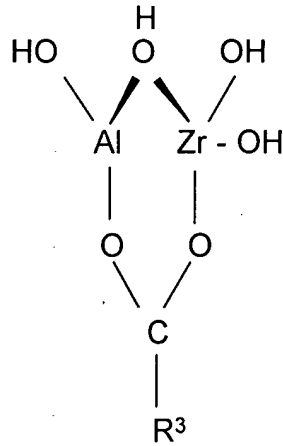
wherein R³ is selected from the group consisting of copolymerizable alkenyl groups and carboxyfunctional substituents containing 1 or more carbon atoms.

79. (currently amended, withdrawal contested) The functionalized zirconium oxide particles of claim 17 wherein the organofunctional coupling agent groups comprise ~~moieties~~ moieties selected from the group consisting of neopentyl (diallyl) oxy trimethacryl zirconates, neopentyl (diallyl) oxy triacryl zirconates, and aluminozirconates having the following general structure:



wherein R^3 is selected from the group consisting of copolymerizable alkenyl groups and carboxyfunctional substituents containing 1 or more carbon atoms.

80. (currently amended, withdrawal contested) The functionalized zirconium oxide particles of claim 18 wherein the organofunctional coupling agents groups comprise moieties moieties selected from the group consisting of neopentyl (diallyl) oxy trimethacryl zirconates, neopentyl (diallyl) oxy triacryl zirconates, and aluminozirconates having the following general structure:



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8 wherein R³ is selected from the group consisting of copolymerizable alkenyl groups and
9 carboxyfunctional substituents containing 1 or more carbon atoms.

1 81. (currently amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 2 wherein said organofunctional groups coupling agents are
3 methacryloxy aluminozirconates.

1 82. (currently amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 5 wherein said organofunctional groups coupling agents are
3 methacryloxy aluminozirconates.

1 83. (currently amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 6 wherein said organofunctional groups coupling agents are
3 methacryloxy aluminozirconates.

1 84. (currently amended, withdrawal contested) The functionalized zirconium
2 metal oxide particles of claim 17 wherein said organofunctional groups coupling agents are
3 methacryloxy aluminozirconates.

1 85. (currently amended, withdrawal contested) The functionalized zirconium
2 oxide particles of claim 18 wherein said organofunctional groups coupling agents are
3 methacryloxy aluminozirconates.

1 86. (currently amended) Functionalized zirconium oxide particles comprising:
2 ~~a surface~~ surfaces comprising a total quantity of hydroxyl groups comprising a
3 complexed fraction of hydroxyl groups comprising a reactive portion of
4 hydroxyl groups and a less reactive portion of hydroxyl groups;
5 said reactive portion of hydroxyl groups being complexed with functionalities
6 selected from the group consisting of functionalities with high steric
7 hindrance, functionalities with low steric hindrance, and a combination
8 thereof;
9 said less reactive portion of hydroxyl groups being complexed with said groups
10 having a low steric hindrance;
11 wherein one or more of said functionalities with high steric hindrance and said
12 functionalities with low steric hindrance is bound to the oxide surface via an
13 ester linkage to a phosphonate group.

1 87. (previously amended) The functionalized zirconium oxide particles of claim 2
2 wherein one or more of said organofunctional coupling agent and said mobile adhesion
3 promoter is bound to the oxide surface via an ester linkage to a phosphonate group.

1 88. (previously amended) The functionalized zirconium oxide particles of claim 5
2 wherein one or more of said organofunctional coupling agents and said mobile adhesion
3 promoter is bound to the oxide surface via an ester linkage to a phosphonate group.

1 89. (previously amended) The functionalized zirconium oxide particles of claim 6
2 wherein one or more of said organofunctional coupling agents and said less reactive
3 functionalities is bound to the oxide surface via an ester linkage to a phosphonate group.

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1 90. (previously amended) The functionalized zirconium oxide particles of claim
2 17 wherein one or more of said organofunctional coupling agents and said less reactive
3 functionalities is bound to the oxide surface via an ester linkage to a phosphonate group.

1 91. (previously amended) The functionalized zirconium oxide particles of claim
2 18 wherein one or more of said organofunctional coupling agents and said less reactive
3 functionalities is bound to the oxide surface via an ester linkage to a phosphonate group.

1 92. (previously amended) The functionalized zirconium oxide particles of claim
2 86 wherein said phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 93. (previously amended) The functionalized zirconium oxide particles of claim
2 87 wherein said phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 94. (previously amended) The functionalized zirconium oxide particles of claim
2 88 wherein said phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 95. (previously amended) The functionalized zirconium oxide particles of claim
2 89 wherein said phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 96. (previously amended) The functionalized zirconium oxide particles of claim
2 90 wherein the phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 97. (previously amended) The functionalized zirconium oxide particles of claim
2 91 wherein the phosphonate group comprises a silyl ester which may or may not comprise a
3 polymerizable group.

1 98. (previously amended) The functionalized zirconium oxide particles of claim 1
2 wherein the functionality with low steric hindrance is selected from the group consisting of
3 silanes, phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester
4 linked fatty acids.

1 99. (previously amended) The functionalized zirconium oxide particles of claim 2
2 wherein the mobile adhesion promoter is selected from the group consisting of silanes,
3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 100. (previously amended) The functionalized zirconium oxide particles of claim 5
2 wherein the mobile adhesion promoter is selected from the group consisting of silanes,

3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 101. (previously amended) The functionalized zirconium oxide particles of claim 6
2 wherein the mobile adhesion promoter is selected from the group consisting of silanes,
3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 102. (previously amended) The functionalized zirconium oxide particles of claim
2 17 wherein the mobile adhesion promoter is selected from the group consisting of silanes,
3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 103. (previously amended) The functionalized zirconium oxide particles of claim
2 18 wherein the mobile adhesion promoter is selected from the group consisting of silanes,
3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 104. (previously amended) The functionalized zirconium oxide particles of claim 2
2 wherein the mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 105. (previously amended) The functionalized zirconium oxide particles of claim 5
2 wherein the mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 106. (previously amended) The zirconium oxide particles of claim 6 wherein the
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 107. (previously amended) The zirconium oxide particles of claim 17 wherein the
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 108. (previously amended) The zirconium oxide particles of claim 18 wherein the
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 109. (previously amended) The zirconium oxide particles of claim 1 having an
2 average diameter of from about 10 to about 150 nanometers.

1 110. (previously amended) The zirconium oxide particles of claim 2 having an
2 average diameter of from about 10 to about 150 nanometers.

1 111. (previously amended) The zirconium oxide particles of claim 3 having an
2 average diameter of from about 10 to about 150 nanometers.

1 112. (previously amended) The zirconium oxide particles of claim 4 having an
2 average diameter of from about 10 to about 150 nanometers.

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1 113. (currently amended, withdrawal contested) A composition comprising the
2 zirconium oxide particles of claim 2 and a matrix comprising at least one monomer
3 comprising a polymerizable group which is polymerizable with the organofunctional
4 coupling agent.

1 114. (currently amended, withdrawal contested) A composition comprising the
2 zirconium oxide particles of claim 5 and a matrix comprising at least one monomer
3 comprising a polymerizable group which is polymerizable with the organofunctional
4 coupling agent.

1 115. (currently amended, withdrawal contested) A composition comprising the
2 zirconium oxide particles of claim 6 and a matrix comprising at least one monomer
3 comprising a polymerizable group which is polymerizable with the organofunctional
4 coupling agent.

1 116. (currently amended, withdrawal contested) A composition comprising the
2 zirconium oxide particles of claim 18 and a matrix comprising at least one monomer
3 comprising a polymerizable group which is polymerizable with the organofunctional
4 coupling agent.

1 117. (currently amended, withdrawal contested) A composite comprising the
2 composition of claim 113 wherein said polymerizable group and said organofunctional
3 coupling agent are copolymerized.

1 118. (currently amended, withdrawal contested) A composite comprising the
2 composition of claim 114 wherein said polymerizable group and said organofunctional
3 coupling agent are copolymerized.

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1 119. (currently amended, withdrawal contested) A composite comprising the
2 composition of claim 115 wherein said polymerizable group and said organofunctional
3 coupling agent are copolymerized.

1 120. (currently amended, withdrawal contested) A composite comprising the
2 composition of claim 116 wherein said polymerizable group and said organofunctional
3 coupling agent are copolymerized.

1 121. (previously amended, withdrawal contested) The composition of claim 113
2 comprising a dental restorative composition.

1 122. (previously amended, withdrawal contested) The composition of claim 117
2 comprising a dental restorative composition.

1 123. (previously amended, withdrawal contested) The composition of claim 113
2 comprising a prototyping composition.

1 124. (previously amended, withdrawal contested) The composition of claim 117
2 comprising a prototyping composition.

1 125. (previously canceled) A method comprising:
2 providing metal oxide particles comprising a surface comprising a total quantity of
3 hydroxyl groups comprising a reactive portion and a less reactive portion;
4 complexing said reactive portion with a functionality selected from the group
5 consisting mobile adhesion promoters, organofunctional coupling agents, and
6 a combination thereof; and,
7 complexing said less reactive portion with said mobile adhesion promoters.

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1 126. (previously canceled) The method of claim 125 further comprising mixing
2 said functionalized metal oxide particles in a solvent with a hydrophobic matrix comprising
3 at least one monomer comprising a component polymerizable with the organofunctional
4 coupling agent.

1 127. (previously canceled) The method of claim 125 further comprising removing
2 said solvent from said mixture, producing a composite that maintains a mobile state for a
3 period longer than the same composite in the absence of said complexed fraction.

1 128. (currently amended) The functionalized zirconium oxide particles of claim 45
2 wherein the organofunctional coupling agents ~~groups~~ comprise ~~moeities~~ moieties selected
3 from the group consisting of neopentyl (diallyl) oxy trimethacryl zirconates and neopentyl
4 (diallyl) oxy triacryl zirconates.

1 129. (currently amended) The functionalized zirconium oxide particles of claim 2
 2 wherein the organofunctional coupling agents ~~groups~~ comprise ~~moeities~~ moieties selected
 3 from the group consisting of neopentyl (diallyl) oxy trimethyacryl zirconates and neopentyl
 4 (diallyl) oxy triacryl zirconates.

1 130. (currently amended) The functionalized zirconium oxide particles of claim 66
 2 wherein the organofunctional coupling agents ~~groups~~ comprise moieties ~~moeities~~ selected
 3 from the group consisting of neopentyl (diallyl) oxy trimethyacryl zirconates and neopentyl
 4 (diallyl) oxy triacryl zirconates.

Cl Cont 1 131. (currently amended) The functionalized zirconium oxide particles of claim 70
 2 wherein the organofunctional coupling agents ~~groups~~ comprise ~~moeities~~ moieties selected
 3 from the group consisting of neopentyl (diallyl) oxy trimethyacryl zirconates and neopentyl
 4 (diallyl) oxy triacryl zirconates.

1 132. (currently amended) The functionalized zirconium oxide particles of claim 75
 2 5 wherein the organofunctional groups comprise moeities selected from the group consisting
 3 of neopentyl (diallyl) oxy trimethyacryl zirconates and neopentyl (diallyl) oxy triacryl
 4 zirconates.

1 133. (currently amended) The functionalized zirconium oxide particles of claim 75
 2 8 wherein the organofunctional groups comprise moeities selected from the group consisting
 3 of neopentyl (diallyl) oxy trimethyacryl zirconates and neopentyl (diallyl) oxy triacryl
 4 zirconates.

1 134. (currently amended) The functionalized zirconium oxide particles of claim 3
 2 2 wherein the mobile adhesion promoter is selected from the group consisting of silanes,

3 phosphonates, phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty
4 acids.

1 135. (original) The functionalized metal oxide particles of claim 66 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 136. (original) The functionalized metal oxide particles of claim 70 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 137. (original) The functionalized metal oxide particles of claim 71 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 138. (original) The functionalized metal oxide particles of claim 75 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 139. (original) The functionalized metal oxide particles of claim 130 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 140. (original) The functionalized metal oxide particles of claim 131 wherein the
2 mobile adhesion promoter is selected from the group consisting of silanes, phosphonates,
3 phosphates, chelating agents, fatty acids, fatty alcohols, and ester linked fatty acids.

1 141. (original) The metal oxide particles of claim 2 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.


1 142. (currently amended) The metal oxide particles of claim ~~33~~8 wherein said
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 143. (currently amended) The metal oxide particles of claim ~~38~~10 wherein said
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 144. (original) The metal oxide particles of claim 66 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 145. (original) The metal oxide particles of claim 70 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 146. (original) The metal oxide particles of claim 71 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

 1 147. (original) The metal oxide particles of claim 75 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 148. (currently amended) The metal oxide particles of claim ~~128~~5 wherein said
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 149. (original) The metal oxide particles of claim 129 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 150. (original) The metal oxide particles of claim 130 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 151. (original) The metal oxide particles of claim 131 wherein said mobile
2 adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 152. (currently amended) The metal oxide particles of claim ~~132~~6 wherein said
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 153. (currently amended) The metal oxide particles of claim ~~133~~ 8 wherein said
2 mobile adhesion promoter comprises dimethyl ethoxy vinyl silane.

1 154. (new) The functionalized zirconium oxide particles of claim 2 wherein said
2 complexed fraction of hydroxyl groups is about 50% or more of said total quantity of
3 hydroxyl groups.

1 155. (new) The functionalized zirconium oxide particles of claim 5 wherein said
2 complexed fraction of hydroxyl groups is about 50% or more of said total quantity of
3 hydroxyl groups.

1 156. (new) The functionalized zirconium oxide particles of claim 6 wherein said
2 complexed fraction of hydroxyl groups is about 50% or more of said total quantity of
3 hydroxyl groups.

1 157. (new) The functionalized zirconium oxide particles of claim 8 wherein said
2 complexed fraction of hydroxyl groups is about 50% or more of said total quantity of
3 hydroxyl groups.

1 158. (currently amended) The functionalized zirconium oxide particles of claim 76
2 wherein said complexed fraction of hydroxyl groups is about 50% or more of said total
3 quantity of hydroxyl groups.

1 159. (new) The functionalized zirconium oxide particles of claim 149 wherein said
2 complexed fraction of hydroxyl groups is about 50% or more of said total quantity of
3 hydroxyl groups.
